LCFIPlus secondary vertexing cut workflow in Standard Reconstruction

AVF = OFF

Good track selection for BuildUpVertex algorithm

$0 < |d_0| < 10$ | $0 < |z_0 - z_{IP}| < 20$ | $0 < \sigma_{d0} < 0.1$ | $0 < \sigma_{z0} < 0.1$ | $p_T > 0.1$ | not from IP

$0 < \frac{|d_0|}{\sigma_{d0}} < 10^{300}$ | $0 < \frac{|z_0|}{\sigma_{z0}} < 10^{300}$ | $0 < \sqrt{(\frac{|d_0|}{\sigma_{d0}})^2 + (\frac{|z_0|}{\sigma_{z0}})^2} < 10^{300}$ | $R_{\text{innermost hit}} < 10^{10}$

VTX+FTD hits ≥ 0 OR VTX hits $\geq 10^4$ OR FTD hits $\geq 10^4$ OR TPC hits $\geq 10^4$ and $p_T > 999999$

Track pairing cuts in VertexFinderSuehara

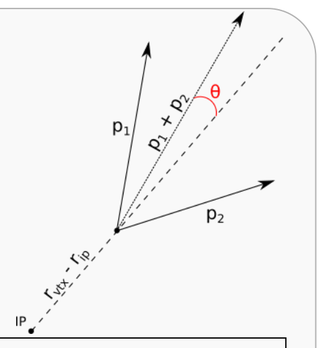
$(p_1^\mu + p_2^\mu)_M \leq min(E_1, E_2)$ | $(p_1^\mu + p_2^\mu)_M \leq 10$

V_0 check (very tight high purity cuts)

$0.3 < R_{\text{vtx}} < 10^{300}$

$N_{\text{tracks}} = 2$

$q_1 = -q_2$



K_s^0 hypothesis

$\cos\theta > 0.999$ ($|\theta| < 2.56^\circ$)

$|(p_{1,\pi}^\mu + p_{2,\pi}^\mu)_M - m_{K_s^0}| < 0.005$

OR

Λ^0 hypothesis

$\cos\theta > 0.99995$ ($|\theta| < 0.57^\circ$)

$|(p_{1,p}^\mu + p_{2,\pi}^\mu)_M - m_{\Lambda^0}| < 0.005$ ($|\vec{p}_1| > |\vec{p}_2|$)

OR

γ conversion hypothesis

$\cos\theta > 0.99995$ ($|\theta| < 0.57^\circ$)

$R_{\text{vtx}} > 9$

$\sqrt{|(|\vec{p}_1||\vec{p}_2|(1 - \cos(\lambda_1 - \lambda_2))} < 0.005$

Mass assumptions: $m_\pi = 0.1396$, $m_{K_s^0} = 0.498$, $m_p = 0.9383$, $m_{\Lambda^0} = 1.1157$

Passed V_0 check

$\chi^2 < 2$

Found V0 vertex

$\chi^2 = max(\chi^2_{\text{track}_1}, \chi^2_{\text{track}_2}, \ldots, \chi^2_{\text{track}_n})$

Failed V_0 check

$\chi^2 < 9$

$\cos\theta_{\text{ip}=0} > 0$ ($|\theta| < 90^\circ$)

Found vertex

Adding more tracks to the vertex

Example cuts for the 3rd track

$(p_1^\mu + p_2^\mu + p_3^\mu)_M - (p_1^\mu + p_2^\mu)_M \leq min(E_{1+2}, E_3)$ | $\vec{p}_3 \cdot \vec{r}_{\text{vtx}} \geq 0$ | $(p_1^\mu + p_2^\mu + p_3^\mu)_M \leq 10$

3rd track: $\chi^2 < 9$

4+ track: $\chi^2 < \chi^2_{\text{prev}}$

Remove all V_0 tracks from non-V_0 vertices and update the vertices

Moving IP tracks to the secondary vertices

$(p^\mu_{\text{vtx}} + p^\mu_{\text{ip track}})_M - (p^\mu_{\text{vtx}})_M \leq min(E_{\text{vtx}}, E_{\text{ip track}})$ | $\vec{p}_{\text{ip track}} \cdot \vec{r}_{\text{vtx}} \geq 0$ | $\chi^2_{\text{new}} < \chi^2_{\text{ip}}/2$

Add ip track to the secondary vertex; refit the vertex

Remove ip track from the ip vertex; refit the ip vertex (with smearing ON)